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EXAMINER

KEEHAN, C

ART UNIT

PAPER NUMBER

1741

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/223,472

Applicant(s)

LEE, KEVIN J.

Examiner

Christopher M. Keehan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 18, 19 and 21-38 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 18, 19 and 21-38 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claims ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some * c) ☐ None of the CERTIFIED copies of the priority documents have been:
1. ☐ received.
2. ☐ received in Application No. (Series Code / Serial Number) ____.
3. ☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 18) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: ____.

DETAILED ACTION***Response to Arguments***

Applicant's arguments filed 10/30/2000 have been fully considered but they are not persuasive. Regarding Applicant's arguments that Applicant has shown that the instant invention differs from Mori (5,443,707), it is the Examiner's position that there is no difference in Mori from the instant invention as claimed. Mori does direct liquid material angularly toward the substrate surface, as angularly can be any angle, including 0° from vertical, and Mori clearly shows that flow of solution impinges on the substrate and flows out the sides of the cup. The liquid would have had to have created a swirling, eddying motion, in a rotational pattern. Applicant's submission of Transport Phenomena by Bird, Stewart, and Lightfoot, pages 219-220, shows the flow of liquid through a cylindrically shaped passage. However, it does not show the liquid first flowing through a round, mesh shaped anode, the effects that the shape of the anode has on the liquid flow and direction, and it does not show the liquid material impinging on a surface located in the pathway of the flow. Therefore, it appears that Mori's flow is not plug flow and would have impinged the substrate at any number of angles.

Regarding Applicant's arguments that Mori does not teach rotational flow "so that the liquid material flows rotationally upon contact with the substrate surface" (Claims 1, 18, and 34), it is the Examiner's position that Mori does teach rotational flow. Mori teaches rotation of the substrate, which in turn creates a rotational flow pattern of the

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liquid in contact with the substrate. Applicant does not claim the non-rotation of a substrate. Therefore, Mori meets the limitations of the claims.

Regarding Applicant's argument that "directing the liquid angularly" as claimed in Claims 1, 18, and 34, does not include 0°, it is the Examiner's position that 0° is an angle from perpendicular and is an angular application of the liquid. Applicant has not given a definition in the specification of what angles "angularly" pertains to, and therefore 0° would have been an angle from perpendicular. Applicant has not excluded perpendicular flow direction toward the substrate.

Regarding Applicant's arguments concerning the last office action stating "Applicant has not claimed any criticality of rotational flow of the liquid..", it is the Examiner's position that Applicant has not claimed any criticality of rotational flow of the liquid. Mori does teach rotational flow of the substrate and would have therefore also created a rotational flow of liquid on the substrate surface. Applicant does not claim non-rotation of the substrate and therefore Mori meets the limitations of claims 1, 18, and 34.

Regarding Applicant's arguments concerning the Examiner trying to assert that the flow lines illustrated in Mori are a plurality of vents, the flow lines of Mori are clearly flow lines showing the liquid material flowing through an injection hole, passing through a plurality of outlets in the mesh anode, impinging on the substrate surface, and flowing out the top of the overflow cup. Although reference was not made by the Examiner to the flow lines of Mori regarding the plurality of outlets, the submitted art Transport Phenomena by Bird, Stewart, and Lightfoot, pages 219-220, does not appear to show

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the passage of liquid through a plurality of vents in a mesh anode nor does it show the impinging of liquid on a substrate. Therefore, the flow lines of Mori appear to be correct.

Regarding Applicant's arguments concerning Claim 19, a plurality of outlets, the same reasoning applies as applied to Claim 19 in the last office action. It is the Examiner's position that the cited lines of Mori (col.3, lines 41-46) disclose the mesh anode comprising a plurality of spray outlets.

Regarding Applicant's arguments concerning Claim 21, the same reasoning applies as applied to Claim 21 in the last office action. It is the Examiner's position that the cited Figure 6 of Mori disclose the mesh anode comprising a plurality of spray outlets angled at approximately 20 to 60 degrees from vertical.

Regarding Applicant's arguments concerning Claim 21, the same reasoning applies as applied to Claim 21 in the last office action. It is the Examiner's position that the cited Figure 6 of Mori disclose the mesh anode comprising a plurality of spray outlets angled at approximately 20 to 60 degrees from vertical.

Regarding Applicant's arguments concerning Claims 22 and 23, the same reasoning applies as applied to Claims 22 and 23 in the last office action. It is the Examiner's position that the cited section (col.4, lines 20-34) and Figure 6 disclose liquid directed radially outward with respect to the center of the substrate surface, and liquid directed circumferentially with respect to a perpendicular direction toward the substrate surface.

Regarding Applicant's arguments concerning Claims 24-26, by citing col.5, lines 42-46, the Examiner was not trying to direct the Applicant to the ELECTRIC FIELD lines

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as indicated by Applicant, rather to show the mesh anode from a top view and the locations of the plurality of spray outlets to meet the limitations of Claims 24-26. Mori discloses at least one of a plurality of spray outlets pointed in a perpendicular direction toward the center of the substrate surface, the plurality of spray outlets includes at least four spray outlets forming a cross pattern, and the plurality of spray outlets includes at least one spray outlet located at the center of the cross pattern, respectively.

In summary, to ensure clarification, the Examiner is taking the following positions:

X a) rotational liquid flow is achieved in Mori by virtue of a rotating substrate. Applicant does not claim a non-rotating substrate so Mori meets the limitations of Claims 1, 18, and 34; b) the submitted art Transport Phenomena by Bird, Stewart, and Lightfoot, pages 219-220, does not appear to apply in this case because there is no reference to the effects of the passage of liquid material through a rounded mesh anode and the subsequent impinging of liquid on a substrate; c) the mesh anode of Mori comprises a plurality of spray outlets as defined and explained in the last office action; d) 0° from perpendicular can be an angularly application of the liquid material because Applicant has not provided a definition of angular application..

DETAILED ACTION

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

Claims 1-5 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Mori (5,443,707). The rejection is as set forth in the prior office action.

Claims 19 and 21-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Mori (5,443,707). The rejection is as set forth in the prior office action.

Regarding Claims 27-33, the same reasoning set forth above for Claims 19 and 21-26 also applies to Claims 27-33, as the subject matter is essentially the same, except for the limitation as set forth in Claim 18. The rejection is as set forth in the prior office action.

Claims 34-38 are rejected under 35 U.S.C. 102(b) as being anticipated by Mori (5,443,707). The rejection is as set forth in the prior office action.

New Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 1,3,4,and 18-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Kobayashi (5,830,334). Regarding Claims 1 and 18, Kobayashi discloses a method of electroplating comprising placing a substrate surface within an enclosure, introducing liquid material into the enclosure, and directing the liquid material angularly toward the substrate surface so that the liquid flows rotationally upon contact with the substrate surface (col.3, lines 33-45 and Figure 2).

Regarding Claims 3 and 4, Kobayashi discloses providing a cathode contact and coupling the cathode contact to the substrate surface, an anode coupled to a cathode and a liquid material is an electrolytic bath to form an electrolytic cell, and a metallic film is formed in the surface (col.5, line 52-col.6, line 22).

Regarding Claim 19, Kobayashi discloses introducing a liquid by spraying the liquid out of a plurality of spray outlets (Figure 2).

New Claim Rejections - 35 USC § 103

Claims 1,27-33, and 34-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomoeda et al. (5,629,913). Regarding Claim 1, Tomoeda et al. disclose a method of applying a liquid material onto a substrate surface comprising placing a substrate within an enclosure, introducing a liquid material into the enclosure, and directing the liquid material angularly toward the substrate surface (col.11, lines 25-

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57 and Figure 12). Tomoeda et al. are silent regarding the liquid flowing rotationally upon contact with the substrate surface. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the liquid flow rotationally upon contact with the substrate surface as instantly claimed because at least similar conditions and materials being used would result in at least similar results, absent evidence to the contrary.

Regarding Claim 27, Tomoeda et al. disclose spraying liquid out of a plurality of spray outlets (Figure 12).

Regarding Claims 28 and 34, Tomoeda et al. disclose placing a semiconductor substrate surface within an enclosure, providing spray outlets, wherein the spray outlets are angled, introducing a liquid material into the nozzle, and directing the liquid material through the spray outlets toward the substrate surface (col.11, lines 35-49). Tomoeda et al. are silent regarding the spray outlets being angled from 20 to 60° from vertical and the liquid material flowing rotationally upon contact with the substrate surface.

Tomoeda et al. do disclose the injection nozzles being arranged at an equal angular interval, and the injection nozzles being capable of angle adjustment to change the injection angles (col.11, lines 44-48). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have applied the liquid at a variety of injection angles from vertical, including that as instantly claimed, because Tomoeda et al. teach that changing the injection angles allows for greater coverage of the substrate resulting in a more efficient process. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the liquid flow

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rotationally upon contact with the substrate surface as instantly claimed because at least similar conditions and materials being used would result in at least similar results, absent evidence to the contrary.

Regarding Claims 29 and 30, the same reasoning as set forth above for Claim 28 also applies to Claims 29 and 30, as the claimed subject matter is essentially the same.

Regarding Claims 31-33, Tomoeda et al. are silent regarding at least one of a plurality of spray outlets pointed in a perpendicular direction toward the center of the substrate surface, a plurality of spray outlets includes at least four spray outlets forming a cross pattern, and a plurality of spray outlets including at least one spray outlet located at the center of the cross pattern. Tomoeda et al. do disclose the injection nozzles being arranged at an equal angular interval, and the injection nozzles being capable of angle adjustment to change the injection angles (col.11, lines 44-48). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the at least one of a plurality of spray outlets pointed in a perpendicular direction toward the center of the substrate surface, a plurality of spray outlets includes at least four spray outlets forming a cross pattern, and a plurality of spray outlets including at least one spray outlet located at the center of the cross pattern as instantly claimed in the process of Tomoeda et al. by routine experimentation and design modification to obtain optimum results because Tomoeda et al. teach that injection nozzles being capable of angle adjustment to change the injection angles produces more complete liquid coverage resulting in a more efficient process.

Regarding Claims 35 and 36, the same reasoning as set forth above for Claim 34 also applies to Claims 35 and 36.

Regarding Claims 37 and 38, Tomoeda et al. are silent regarding a plurality of spray outlets including at least four spray outlets forming a cross pattern, and a plurality of spray outlets further includes at least one spray outlet located at the center of the

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cross pattern. However, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to have located the spray outlets in a variety of locations, including that as instantly claimed, based on the conditions and the types of materials being used.

Claims 1, 3-5, 18, 19, 22-27, and 29-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arken et al. (6,001,235). Regarding Claims 1 and 18, Arken et al. disclose a method of applying a liquid material onto a substrate surface comprising placing a substrate within an enclosure, introducing a liquid material into the enclosure, and directing the liquid material angularly toward the substrate surface (col.5, lines 5-30 and Figures 1 and 2) and directing the liquid toward the substrate surface so that a swirling of the plating solution around the plating surface occurs (col.2, line 65-col.3, line 20). It is the Examiner's position that the swirling motion on the surface of the substrate of Arken et al. would have been occurring rotationally as instantly claimed. The Examiner is relying on the definition of swirl - *to move with an eddying or whirling motion*, and the definition of whirling – *a rapid rotating or circling movement* (Merriam-Webster's Collegiate Dictionary, Tenth Edition).

Regarding Claims 3 and 4, Arken et al. disclose providing a cathode contact and coupling the cathode contact to the substrate surface, an anode coupled to a cathode and a liquid material is an electrolytic bath to form an electrolytic cell, and a metallic film is formed in the surface (col.4, lines 6-43).

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Regarding Claim 5, Arken et al. disclose forming a metallic film on the surface (col.4, lines 6-20).

Regarding Claim 19, Arken et al. disclose introducing a liquid by spraying the liquid out of a plurality of spray outlets (col.5, lines 6-30).

Regarding Claims 22 and 23, Arken et al. appear to disclose liquid directed radially outward with respect to the center of the substrate surface, and liquid directed circumferentially with respect to a perpendicular direction toward the substrate surface (col.4, lines 20-34), respectively. It is the Examiner's position that the liquid directed circumferentially with respect to a perpendicular direction toward the substrate surface occurs by the swirling motion as discussed above and in Arken et al. (col.1, line 65- col.2, line 20).

Regarding Claims 24 and 25, Arken et al. disclose at least one of a plurality of spray outlets pointed in a perpendicular direction toward the center of the substrate surface, the plurality of spray outlets includes at least four spray outlets forming a cross pattern (Figure 3).

Regarding Claim 26, Arken et al. are silent regarding a plurality of spray outlets including at least one spray outlet located at the center of the cross pattern. However, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have located the spray outlets in a variety of locations, including that as instantly claimed, as a matter of design choice based on conditions and materials being used.

Regarding Claims 27 and 29-33, the same reasoning as set forth above for Claims 19, and 22-26 also applies to Claims 27, and 29-33, as the claimed subject matter is essentially the same.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arken et al. in view of Mori. Arken et al., as applied to Claims 1 and 18, are as set forth and incorporated herein. Arken et al. are silent regarding pressing the substrate against an enclosure to form a seal. Mori discloses an electroplating process wherein a substrate is covering the opening (col.5, lines 35-41). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted covering the opening as taught by Mori in the electroplating process as taught by Arken et al.

because Mori teaches covering the opening with the substrate produces more complete electroplating coverage resulting in a higher quality product being produced.

Claims 21-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi. Kobayashi, as applied to Claims 1 and 18, is as set forth and incorporated herein. Regarding Claim 21, Kobayashi discloses spray outlets angled from vertical (Figure 2). Although Kobayashi does not specifically disclose spray outlets angled 20 to 60 degrees from vertical, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have angled the spray outlets at a variety of angles, including that as instantly claimed, because Kobayashi teaches that angling spray outlets from vertical creates a rotational, recirculating pattern and more complete coverage of the substrate surface resulting in a higher quality product being produced.

Regarding Claims 22 and 23, Kobayashi appears to disclose liquid directed radially outward with respect to the center of the substrate surface, and liquid directed circumferentially with respect to a perpendicular direction toward the substrate surface (Figure 2), respectively.

Regarding Claims 24-26, Kobayashi is silent regarding at least one of a plurality of spray outlets pointed in a perpendicular direction toward the center of the substrate surface, the plurality of spray outlets includes at least four spray outlets forming a cross pattern, and a plurality of spray outlets including at least one spray outlet located at the center of the cross pattern. However, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to

have located the spray outlets in a variety of locations, including that as instantly claimed, as a matter of design choice based on conditions and materials being used.

Regarding Claim 27, Kobayashi discloses spraying liquid out of a plurality of spray outlets (Figure 2).

Regarding Claims 28 and 34, Kobayashi discloses placing a semiconductor substrate surface within an enclosure, providing spray outlets, wherein the spray outlets are angled, introducing a liquid material into the nozzle, and directing the liquid material through the spray outlets toward the substrate surface to result in rotational flow on the substrate surface (Figure 2). Kobayashi is silent regarding the spray outlets being angled from 20 to 60° from vertical and the liquid material flowing rotationally upon contact with the substrate surface. Kobayashi does disclose the injection nozzles being angled from vertical (Figure 2). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have angled the injection nozzles in a variety of angles, including that as instantly claimed, because Kobayashi teaches that angled the injection angles allows for greater coverage of the substrate resulting in a more efficient process. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the liquid flow rotationally upon contact with the substrate surface as instantly claimed because at least similar conditions and materials being used would result in at least similar results, absent evidence to the contrary.

Regarding Claims 29 and 30, the same reasoning as set forth above for Claim 28 also applies to Claims 29 and 30, as the claimed subject matter is essentially the same.

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Regarding Claims 31-33, Kobayashi is silent regarding at least one of a plurality of spray outlets pointed in a perpendicular direction toward the center of the substrate surface, a plurality of spray outlets includes at least four spray outlets forming a cross pattern, and a plurality of spray outlets including at least one spray outlet located at the center of the cross pattern. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the at least one of a plurality of spray outlets pointed in a perpendicular direction toward the center of the substrate surface, a plurality of spray outlets includes at least four spray outlets forming a cross pattern, and a plurality of spray outlets including at least one spray outlet located at the center of the cross pattern as instantly claimed in the process of Kobayashi by routine experimentation and design modification to obtain optimum results because Kobayashi teaches that angled injection produces more complete liquid coverage resulting in a more efficient process.

Regarding Claims 35 and 36, the same reasoning as set forth above for Claim 34 also applies to Claims 35 and 36.

Regarding Claims 37 and 38, Kobayashi is silent regarding a plurality of spray outlets including at least four spray outlets forming a cross pattern, and a plurality of spray outlets further includes at least one spray outlet located at the center of the cross pattern. However, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to have located the spray outlets in a variety of locations, including that as instantly claimed, based on the conditions and the types of materials being used.

Conclusion

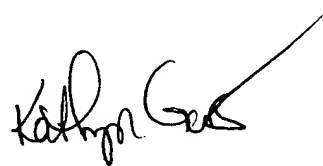
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Uzoh et al. (5,911,619) disclose an apparatus comprising an injection nozzle angled to place liquid on a substrate and the liquid material flowing rotationally upon contact with the substrate surface.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Keehan whose telephone number is (703) 305-2430. The examiner can normally be reached Monday through Thursday from 6:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kathryn Gorgos, can be reached on (703) 308-3328. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-7719.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Christopher Keehan



October 31, 2000